

Hardware Lab 03 – TinyDB

Lab goal: In this lab, we will learn the concept of sensor network database. Different sensors have unique IDs. For each sensor ID, we may record its sensed data in different times. Such records are stored in a sensor database. TinyDB (<http://telegraph.cs.berkeley.edu/tinydb/>) is a typical sensor database.

Step 1. Read the “documentation” in TinyDB website: <http://telegraph.cs.berkeley.edu/tinydb/>. Especially, read the “TinyDB tutorial” (<http://telegraph.cs.berkeley.edu/tinydb/tutorial/tinydb.html>). If you want to learn more, you could read the TinyDB “full document” (<http://telegraph.cs.berkeley.edu/tinydb/doc/index.html>).

Step 2. Although you could follow “installation tutorial”, please notice that your TinyOS already has TinyDB included. Thus you don’t need to re-install TinyDB.

Step 3. Follow “3. Quick Start” in the link: <http://telegraph.cs.berkeley.edu/tinydb/doc/index.html>.

The following are the notes from the lab TA:

Due to the different TinyOS versions, there were a couple of things that had to be done to correct the TinyDB tutorial on the website.

1. The com port of TinyDB is com1 by default. This must be changed within the “tinydb.conf” file located at /opt/tinyos-1.x/java/net/tinyos/tinydb/tindb.conf There is a line in this file that reads:

```
comm-string:serial@COM1$57600
```

This line should be changed to the second(higher) com port of the motes (i.e. comm-string:serial@COM6\$57600)

2. The makefile for the TinyDBApp that is be installed on the motes must be changed for the 917MHz frequency. The following line should be added after the line that reads “SENSORBOARD=micasb” in the makefile located at /opt/tinyos-1.x/apps/TinyDBApp/Makefile:

```
CFLAGS=-DCC1K_DEFAULT_FREQ=1
```

3. When installing TinyDBApp on the motes, the *nodeid* must be specified for each of the motes. For example:

```
make mica2 install.x mib510,/dev/ttyS4
```

where “x” is the nodeid of the mote(0 or 1)

4. To ensure that the radio communications between the base station and other nodes are working, hit the reset button within TinyDB. The LEDs on all nodes should flash.

5. The query sent by the TinyDB application is described as “unreliable” by the author. Thus, users should continue to press “resend query” if the motes do not immediately respond. In my experience, this took 5-6 queries before receiving a response.

After completing all of these steps in addition to those on the TinyDB tutorial, you should be able to generate the “screenshots” as the TinyDB website shows.

Report Requirements:

(1) Attach as many screenshots you captured as possible. Explain each screenshot.

(2) Answer the following questions:

2.1 What is the sensor database structure of TinyDB?

2.2 How does TinyDB perform distributed data query among many sensors? Show a simple case (with only 10 nodes in a tree structure).

2.2 Why does TinyDB use “aggregation” concept during data query?